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Packing of cotton at gins

FOR UNIFORM DENSITY

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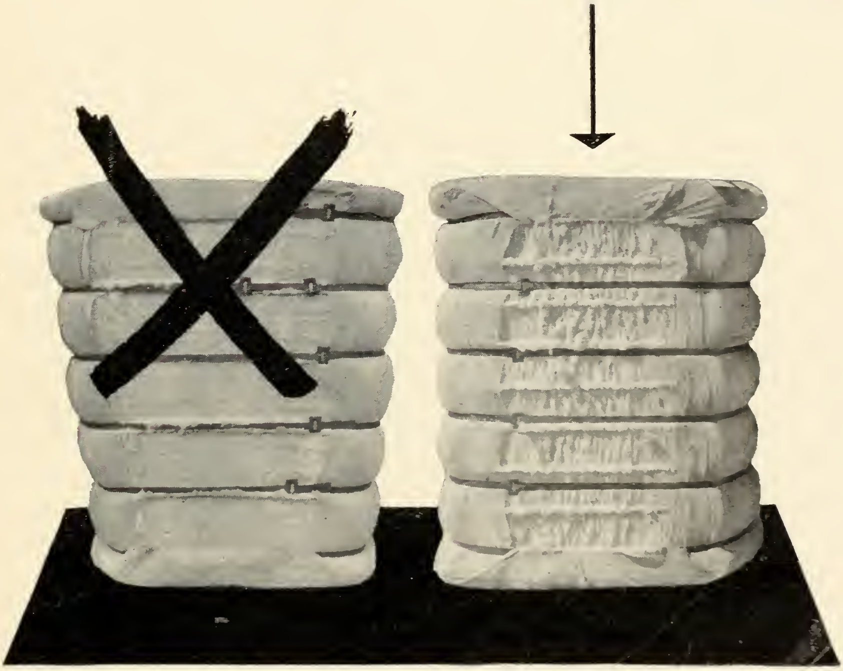

Miscellaneous publication 527

UNITED STATES DEPARTMENT OF AGRICULTURE

CONTENTS

Page

Problems of uneven packing of bales 1
  Wear and tear on gin equipment 2
  Compression difficulties 3
  Inconvenience in handling, shipping, and transportation 4
  Inconvenience in storage 4
Sources of uneven packing and means of elimination 4
  Big-ended bales 5
  Use of lint flue deflector to prevent big-ended bales 6
  Proper care of condenser to prevent big-ended bales 7
  Heavy-sided or rolling bales 8
  Regulation of kicker speed to prevent rolling bales 8
  Adjustments in lint-slide contour to prevent rolling bales 10
  Dog ridges 11
  Modification of dog mechanism to eliminate dog ridges 15
Heavyweight bales as a factor in uneven packing and pressing difficulties 20
Summary and conclusions 21

U. S. DEPARTMENT OF AGRICULTURE

Cotton and Fiber Branch
FOOD DISTRIBUTION ADMINISTRATION

and Bureau of Plant Industry, Soils,
and Agricultural Engineering
AGRICULTURAL RESEARCH ADMINISTRATION

Washington, D. C. *August 1943*

Packing of cotton at gins FOR UNIFORM DENSITY

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PROBLEMS OF UNEVEN PACKING OF BALES

Conventional methods and practices of packing lint cotton at gins often result in irregular [1] or unevenly packed bales. Such bales create problems for cotton ginners, compressmen, warehousemen, and cotton manufacturers as well as others connected with the cotton industry. They are to a considerable extent responsible for the unsymmetrical and ragged appearance of American cotton bales.

Available information indicates that approximately one-third of the American cotton crop is packaged in unevenly packed bales. Observations made and data collected in connection with warehousing, compressing, handling, and transporting of cotton bales show that unevenly packed bales are a source of increased cost in time and labor and a frequent source of accidents. Moreover, a recent study at commercial compresses has shown that uneven gin packing is a factor responsible for compress cutting, which has been a source of complaint by cotton merchants and manufacturers for many years.[2]

Cotton ginners often overlook the importance of producing neat-appearing and uniformly packed bales. Other parts of their ginning plants claim the major portion of their attention when they strive to keep their ginning machinery in first-class condition. Frequently, ginners fail to realize that the far-reaching effects of the pressing process constitute an important contribution to the services they perform. The importance of producing uniformly packed bales of standard weight and size (450 to 550 pounds) is emphasized by the fact that at present there are severe shortages in gin-press and compress repair parts. This situation should not be aggravated by continuing the needless and objectionable practice of producing overweight and unevenly packed bales.

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[1] The term "irregular" will be frequently used in this report to denote big-ended, overweight, heavy-sided, or rolling bales.

[2] WRIGHT J. W., and BENNETT, C. A. THE COMPRESSION OF COTTON AND RELATED PROBLEMS. Agr. Market. Serv. and Bur. Agr. Chem. and Engin. November 1940. [Processed.]

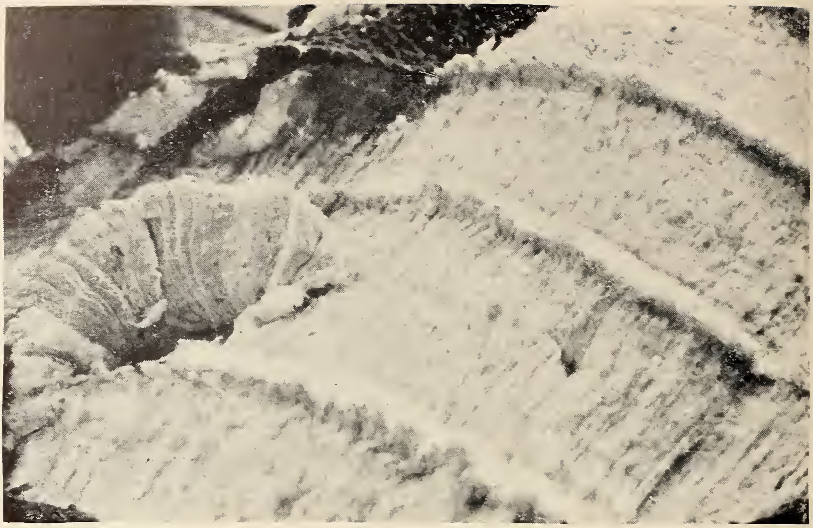

FIGURE 1.—*Cotton bale cut during compression. This photograph is an extreme case of compress cutting.*

Wear and tear on gin equipment

Cotton ginners have a direct interest, from a dollars-and-cents standpoint, in producing evenly packed bales. Uneven gin packing results in unnecessary wear and tear on the gin-press mechanism. This materially affects gin owners through costly repairs, delays, and loss of business due to shutdowns during the busy season.

Many ginners pay little attention to the way individual bales are packed so long as the gin-press mechanism keeps operating. In many instances, they permit relatively more cotton to be deposited in some portions of the bale than in others. Cotton unevenly distributed in the press box subjects the packing and pressing equipment to an excessive amount of strain, which at times becomes great enough to break gin dogs, ramheads, or other parts of the press mechanism. The continual packing and pressing of irregular bales often results in wrenching and twisting the whole gin-press frame. A ginner may operate with his gin-press equipment wrenched and twisted, but he does so only at the expense of additional power and labor, along with an adverse effect on the appearance of his bales.

The press frame and tramper are the parts of the pressing equipment most vitally affected by irregular bales. The tramper receives undue wear because of the side shift and additional strain on guide bars, gears, and other parts, all of which necessitate frequent repairs. The pressing of unevenly packed bales very often forces the press ram out of its normal position, and places severe strain on the ramhead, packing, and casing. Consequently, ram packings blow out, and in some cases the ramheads either break or crack.

When pressing unevenly packed bales, the entire press box and frame assembly is subjected to distortion which eventually results in breakages of weaker parts of the press. A badly worn press with loose press boxes is generally unsafe and may cause expensive repairs as well as considerable difficulty and danger in pressing.

Compression difficulties

Compressmen encounter many problems with unevenly packed bales, chief of which are inconvenience and loss of time. These tend to increase compression costs. Results of observations made at compresses show that approximately 35 percent of all compressed bales are cut during compression (fig. 1). In some cases, portions of cut cotton become jammed into the channels and have to be forced out with iron bars before the crew can proceed with the compression of another bale. Some bales are so unevenly packed and the cuts are so severe that it is necessary for compress crews to halt operations and rebuild the bales in order to remedy the ragged appearance so that the bales may be shipped. Time is lost when bales must be rebuilt, as compression takes place in two operations (fig. 2). These rebuilding and redistributing operations are performed by the compress crew and sometimes may take from 1 to 5 minutes for standard-density compression. Although these operations may require the time and labor of only a small portion of the compress crew, the work of the entire crew is held up by this procedure, since it halts the normal movement of the bales through the press and leaves waiting the truckers

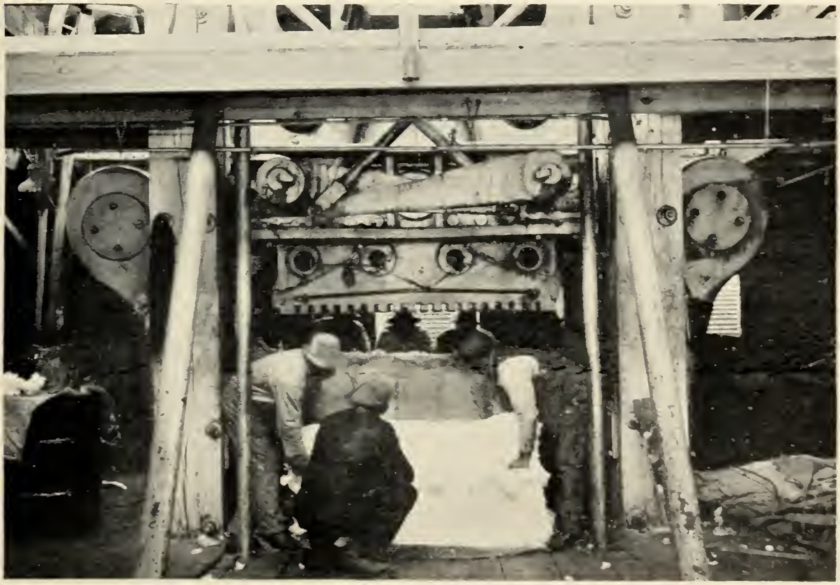

FIGURE 2.—*Compress crew reworking an unevenly packed gin bale to permit satisfactory compression.*

and loading crews, sometimes involving as many as 20 or more workers.

When the bales are compressed to high density, the side doors tend to redistribute the lint and do not permit the bales to roll or shift in the press, with the result that the problem is not so great as when the bales are compressed to standard density.

Compress cutting has been a subject of considerable complaint during recent years, both in European and American spinning circles. As the name implies, compress cutting is the cutting or shearing of cotton fibers during compression, caused by uneven pressure in adjacent parts of an individual bale.[3] Uneven pressure is caused by relatively dense masses of cotton that are built up by uneven distribution of bale layering and that are accentuated by the action of the gin dogs. The effects of gin dogs, however, are more pronounced in the case of extra-heavy bales and bales of low moisture content than in bales of average weight. Observations made at compresses have shown bale cutting to range on the average from less than 5 percent on lightweight bales to more than 50 percent on extra-heavy bales pressed to standard density.

Inconvenience in handling, shipping, and transportation

In order to handle, ship, and transport with minimum effort, individual bales should conform to standard dimensions with equal distribution of weight in all parts of the bale. Unevenly packed bales constitute a real problem in the physical handling of American cotton. They seldom conform to any definite dimensions and when compressed to higher density, they often become unsymmetrical. They are cumbersome to handle and difficult to stack and store with any degree of uniformity. In many instances, the bales are so irregular in shape that they cannot be loaded without being dumped, ends inverted, or turned and twisted many times.

Inconvenience in storage

In recent years, storage space for cotton has become increasingly important. In some parts of the Cotton Belt it has been necessary to build additional cotton warehouses. It has also been necessary to conserve available space by stacking bales in tiers, sometimes 20 or more feet high, a practice which is unusually cumbersome, dangerous, and difficult with unevenly packed bales because of their irregular shape. Such bales also require more space for storage; when stacked in tiers they often roll or fall, thereby causing inconvenience and necessitating extra time and effort for maneuvering the individual bales to stability.

SOURCES OF UNEVEN PACKING AND MEANS OF ELIMINATION

There are several ways in which bales are unevenly packed. Some of these are well known by ginners but others are not. Recent tests have

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[3] For a more complete discussion of the problem see the report cited in footnote 2, p. 1.

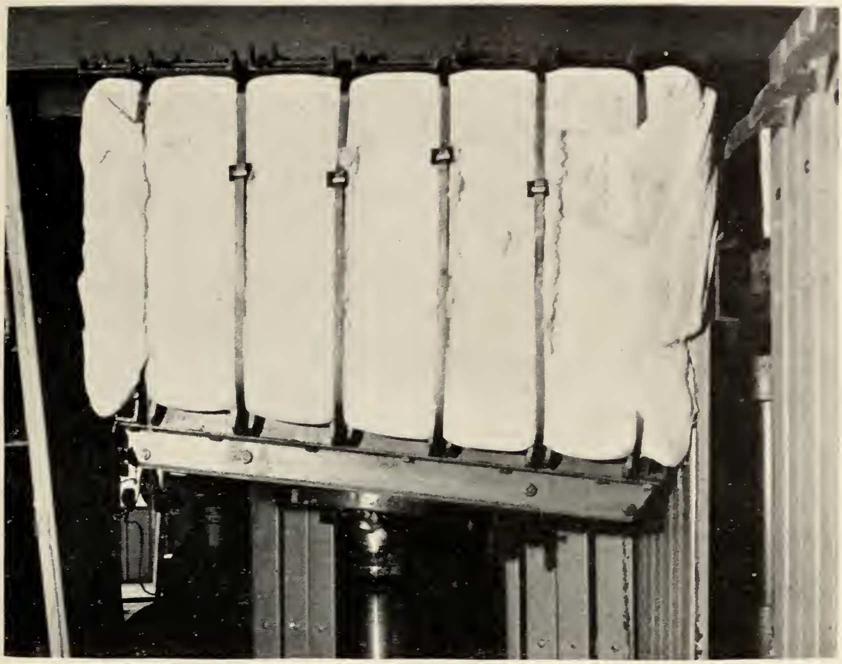

FIGURE 3.—*View of "big-ended," low-density gin bale prior to release from the press. Note slope of follower block which may cause severe strain on or breakage of ram gland.*

disclosed that some of these lesser-known sources are the most important from the standpoint of problems created. For many years unevenly packed bales have been thought of as falling only into the two major classes—big-ended, and heavy-sided or rolling bales. These two extreme cases have been the only ones generally considered as unevenly packed by ginners and compresssmen.

Big-ended bales

Big-ended bales are produced at many gins. Bales designated as big-ended are those which are heavier on one end than on the other. However, they may not have a perimeter greater on one end than on the other. Big-ended bales occur during the ginning process with the depositing of relatively more lint at one end of the condenser than at the other, and the consequent greater thickness of the bale at one end than at the other. During the pressing operation the increased density or weight at one end of the bale forces the press follower blocks into an inclined position, thus forming a wedge-shaped bale (figs. 3 and 4). In such cases, some press hands leave slack in the ties on the light side of the bale, which prevents the uneven weight from being apparent when the bale is released from the press.

Uneven packing is not always distinguishable by the appearance of the bale.

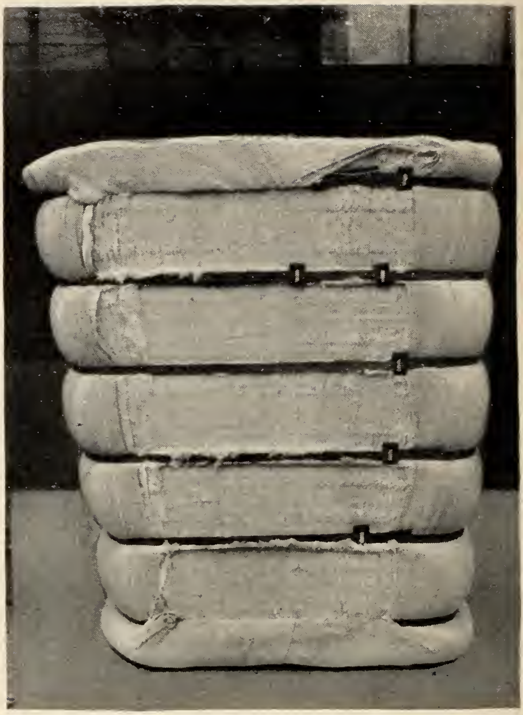

Figure 4.—*A big-ended bale after release from press, tied purposely to retain big-ended shape for illustration.*

Some bales appear to be big-ended although they are not unevenly packed. A faulty press, ram packing, or a defective control valve can cause this condition, because after the bale is pressed and while the ties are being applied, the ram can slip; and between the time the first and last ties are applied, the bale becomes larger at one end than at the other.

A series of tests were conducted to determine comparative power requirements and energy consumption for heavy-sided and big-ended bales in relation to uniformly packed bales. Although the results of these tests indicated variations in power requirements and energy consumption, which favored the uniformly packed bales over the unevenly packed bales, the differences were too small to be considered significant.

The danger of tramper breakage and press distortion is so great with uneven bales that a ginner cannot afford to risk a broken ram or sprung center column, particularly when uneven packing can be eliminated effectively.

Use of lint flue deflector to prevent big-ended bales

Lint cotton is conveyed from the gin stands through the lint flue to the condenser by a continuous air current created by air-blast fans or gin brushes.

Any deviation from uniform air flow automatically disrupts the even flow of lint cotton. Lint flues in a bent or battered condition can at times so affect the flow of air that lint will not travel through them uniformly.

Several forms of sheet-metal deflectors are in use in lint flues to provide uniform distribution of the lint upon the condenser drums. Recent ginning installations are fitted at the factory with curved-plate deflectors of various kinds. Most deflectors of factory construction are located at the stand nearest to the condenser to deflect the main stream as well as that from the final stand. One type is a sliding semicylindrical sleeve which telescopes within the gin-flue outlet and may be protruded into the lint flue in any position necessary to control the lint distribution at the condenser.

Home-made forms of lint flue deflectors are often found at the condenser inlet. These usually are smooth "fins" or "rudders" with a pivot for adjustment, and are placed on the upper surface of the inlet transition to avoid collecting lint.

Proper care of condenser to prevent big-ended bales

If lint cotton is forced through the lint flue unevenly it is likely that it may also discharge unevenly across the face of the condenser drum. Often rust, rivet heads, tags, or protrusions of one kind or another collect lint in the lint flue or on the condenser screen and cause uneven bats. These accumulations at times may grow to such proportions that they alter the course and place at which the lint is deposited against the condenser screen and may discharge more lint against one end of the condenser drum than against the opposite end. The extent to which more lint is deposited at one end of the condenser drum as compared with the opposite end determines the relative size of one end compared with the opposite end of an individual bale.

Lint cotton is separated from the continuous air current at the condenser by means of condenser screen drums, and the conveying air is exhausted through vents or ducts. These vents or exhaust ducts vary in type. Some condenser vents exhaust the air from the top of the condenser, some from the bottom, and others from the side. In either type, the air current should escape evenly to permit the lint to accumulate uniformly. Condenser drums in poor condition or poorly flashed at the ends may also cause big-ended bales when the resistance offered by the drum is not uniform, and thus more air and cotton may be deflected to one end of the drum. The combined action of the lint flue and the condenser is mainly responsible for this condition.

Updraft and side-draft condensers should be cleaned daily, and downdraft condensers deserve a daily inspection, although they are regarded as self-cleaning to a marked degree.

Lint and fly accumulate at screen breakages and at faulty sealing strips, as well as in the lower spaces of the air vents and drum boxes. Both single- and double-drum condensers should be treated alike in daily cleaning and check-up.

Quick shut-downs during ginning may require clean-out of lint spaces above the condenser drum and in the dirt spaces below. Side-draft condensers are prone to build up obstructive piles of trash. These are frequently overlooked because they are in the main vent. They should by all means be given watchful attention.

Heavy-sided or rolling bales

Heavy-sided bales are caused by the distribution of relatively greater quantities of lint cotton across the rear side of the press box than across the front side, or vice versa. Although this type of uneven packing is not so apparent in low-density bales, its effects become more pronounced when such bales are compressed to standard density (fig. 5).

Heavy-sided bales usually do not cause trouble in pressing at the gin and are not readily apparent. Compressmen, however, dislike this type of bale more than any other since it is the chief source of trouble for them. In many cases these bales have to be compressed in two operations, involving the rebuilding of the bale and resulting in losses in time and in pressing capacity.

Regulation of kicker speed to prevent rolling bales

Heavy-sided bales are primarily caused by faulty action of the tramper and lint-slide kicker. During those intervals when the tramper passes the lint slide and is packing cotton into the press box, a charge of cotton will accumulate in the lint slide. It is the function of the kicker to discharge this cotton into the press box while the tramper is in its upward position. If the action of the kicker is too strong or not strong enough, this charge of cotton will not be distributed evenly in the press box. Proper adjustment of the kicker speed and action is essential so that they may be synchronized with the tramper to meet the proper condition. Since the moisture content of cotton varies throughout the ginning season, the kicker should be watched closely and changed throughout the season to meet conditions. Many gins in some sections of the Cotton Belt are not equipped with lint-slide kickers, and the cotton is permitted merely to slide into the press box. In such instances, the tendency is for too much cotton to fall on the back side of the press box, thus resulting in the production of heavy-sided bales.

Although various kinds of mechanisms fall within the general classification of kickers, their speed or rate of sweep is the primary element which affects the distribution of the lint in the press box. If the discharge is too strong, relatively more lint will be deposited in the front of the press box than in the rear. If the discharge is too weak, the reverse will be true. Regulation of kicker speed frequently is so closely related to tramper speed that a change in kicker speed cannot be made without a change in the tramper. The speed of the tramper, however, is not as important as the speed of the kicker, and the speed of both can be adjusted to the requirements of the latter.

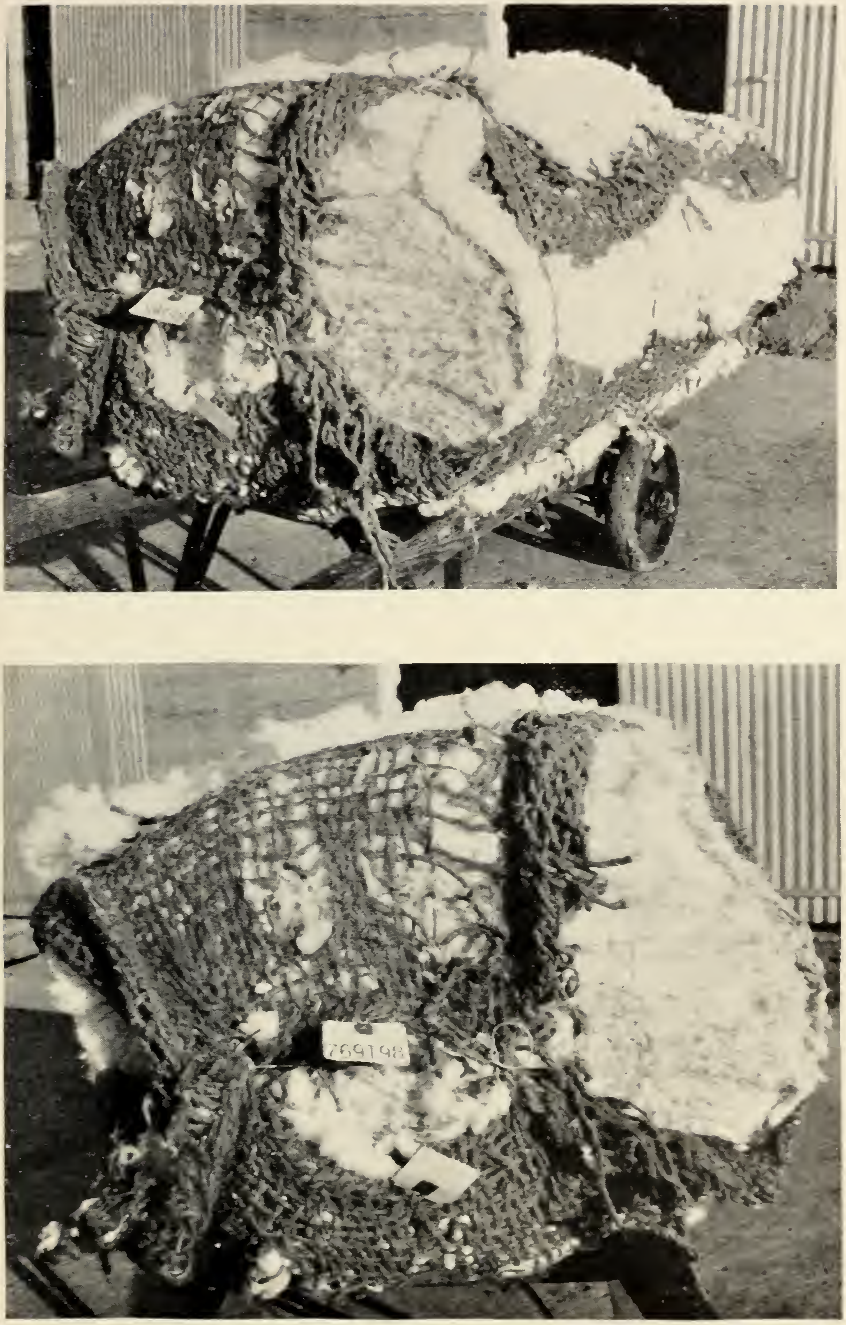

Figure 5.—*Views of heavy-sided or "rolling bales" after compression to standard density.*

The tramper action is in a vertical direction and presses the cotton downward. If the cotton comes into the press box evenly, the tramper will perform accordingly and pack the lint into the press box uniformly. Within a broad range of tramper speeds, it has been observed that variations in speed have little or no effect on uniformity of the bale layering. In many cases, however, kickers are driven from the drive shaft on the tramper, and any change made in tramper speed affects kicker speed. Consequently, changes made in tramper speed in these cases would cause unevenly packed bales because of the associated change in the kicker speed. Besides, the individual cut-off gates working with trampers sometimes produce problems in connection with the packing of bales.

Two general types of cut-off between the lint slide and tramper followers are used: One type is a smooth-faced gate attached to the condenser side of the tramper which moves with the follower at all times. The other type is an individual sliding gate which rests against the lint-slide end and is lifted or lowered only during the upper-half movement of the tramper. With the individual gate, various difficulties are encountered. Lint may accumulate sufficiently on top of the follower to cause troublesome chokages and prevent gate operation, or lint may be sandwiched between the bottom of the slide and the bottom of the gate to cause wadding and wedging. Modification methods under such conditions depend upon the individual gate construction and its clearances with both lint slide and tramper.

Adjustments in lint-slide contour to prevent rolling bales

The lint slide is the connecting channel between the condenser and the press box to transfer the cotton bat from the one to the other. At the lower end of the lint slide is attached the kicker wheel. Condensers are always erected somewhat higher than the press box, and the lint slides are set at an angle. Field observations have disclosed that wide variation exists in the angle at which these lint slides are set. This seems to have little effect on the element of uneven packing, except that a uniform layering of lint in the bale depends to some extent on the lint slide.

The length of the lint slide from condenser to press box is important. A short slide may not provide sufficient storage between tramper strokes to prevent chokages at the condenser outlet during heavy ginning. If the slide is too short for efficient doffing, it usually is also too short for freedom of kicker-wheel action. In rebuilt gins this may cause mechanical difficulties, such as binding the kicker drive wheel against upper platen sills when bales are being pressed, because the lifting movement of the cotton tends to cause some movement of the platen sills.

If the lint slide is steep, and at the same time too long the bat will break by gravity and fall in the form of irregular masses of cotton against the kicker; and if the lint slide does not have enough slope, the bat at times is wrinkled into humps and slugs.

In addition to wide variations that are found in the length and slope of individual gin lint slides, a controlling element has been added in some makes of press outfits to regulate the lower end action of the slide. One commonly used method is to provide at the lower end a scooplike curve which gives a directional lift or arc to the sliding bat of cotton. The amount of upward lift affects the distance to which the cotton is thrown within the press box. Thus by cutting or changing the curvature of the scoop, an adjustment is made to facilitate an equal distribution of cotton within the press box, thereby avoiding heavy-sided bales.

As a further refinement of this idea, some manufacturers provide a hinged lip of suitable contour at the lower end of the lint slide. This simplifies the adjusting and has the advantage of being easily adaptable to changes in the condition of the crop when weather and harvesting conditions change.

Dog ridges

Dog ridges as a type of uneven bale packing has received considerable attention recently. These dog ridges are in the interior of the bale of

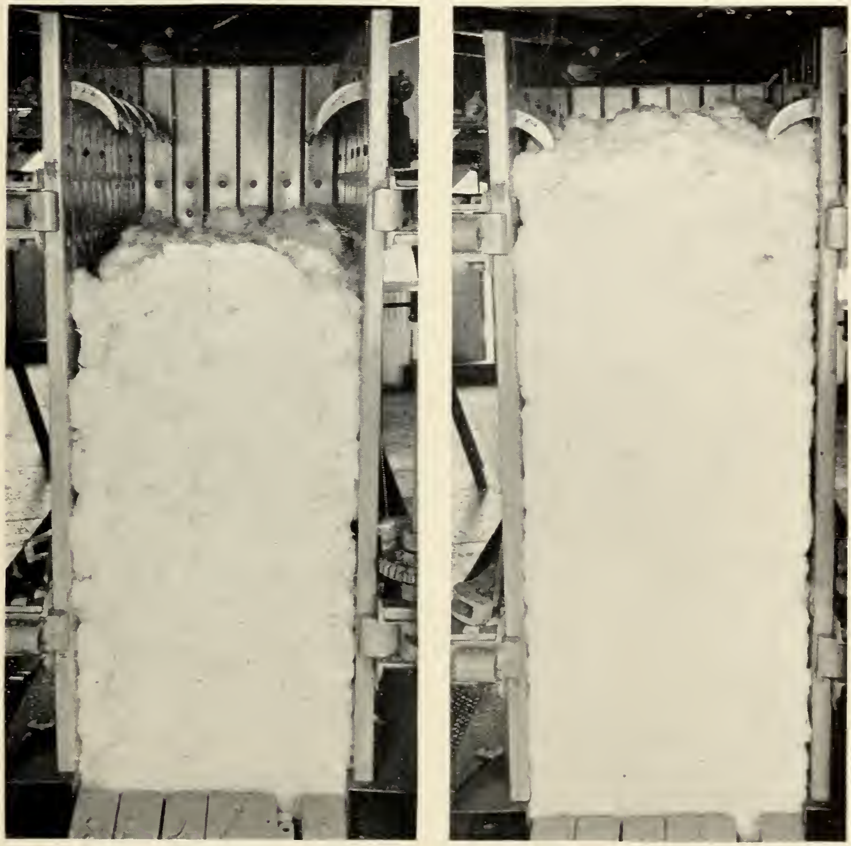

Figure 6.—*Interior end view of all-steel, low-density gin press, showing the position of the dogs while cotton is accumulating in the press box (left), and how the dogs hold the cotton down in the press box while the bale is being ginned (right).*

cotton and result from the combined action of the tramper and press-dog mechanisms.

Press box dogs are mechanical devices whose function is to hold and prevent the lint cotton from rising above a predetermined height in the press box (figs. 6 and 7). They are like fingers which protrude in the press box from 1 to 6 inches. In design, each gin manufacturer has his own type of press dog. Press dogs are usually located from 6 to 24 inches from the top of the press box, depending on make of press, depth of box, and type of press. Some press boxes have 4 dogs to the side, while others have 5 or 6. Some dogs operate freely or independently on a shaft, while others are attached to the shaft.

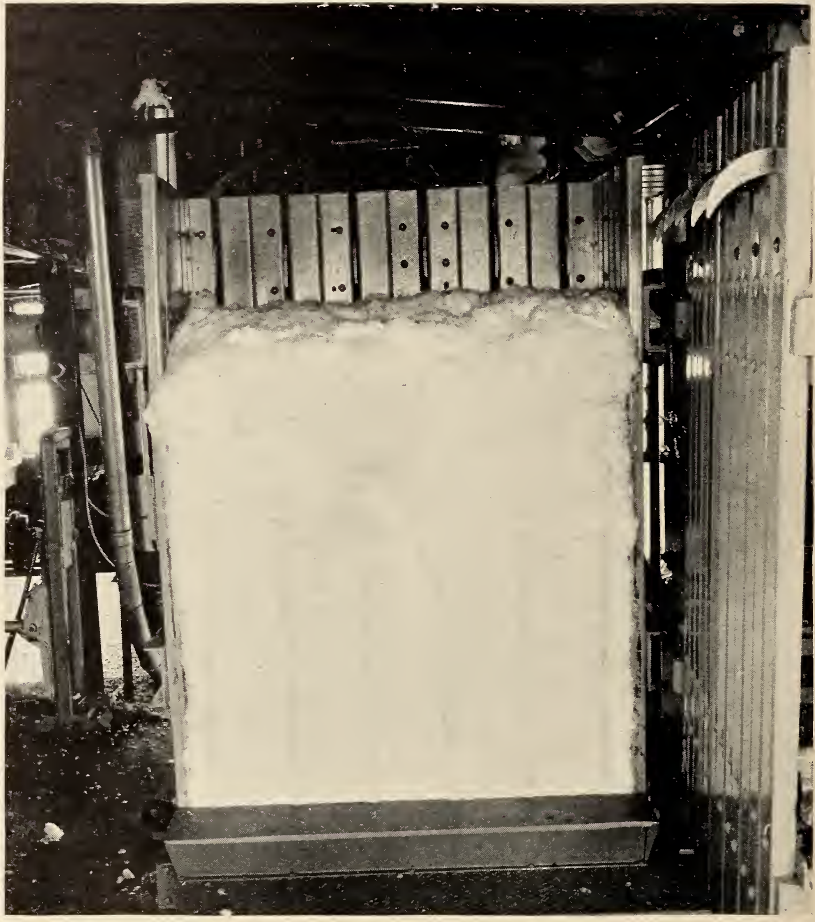

Figure 7.—*Interior side view of an all-steel, low-density press, with the dogs in holding position.*

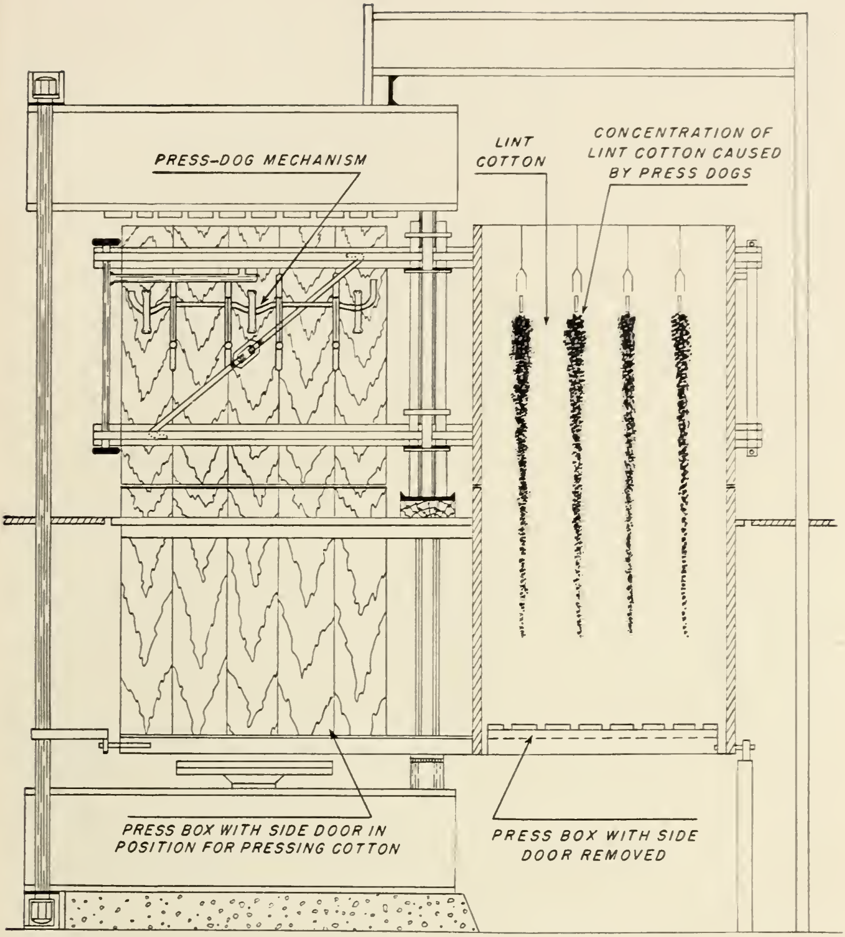
PRESS-DOG MECHANISM
LINT COTTON
CONCENTRATION OF LINT COTTON CAUSED BY PRESS DOGS
PRESS BOX WITH SIDE DOOR IN POSITION FOR PRESSING COTTON
PRESS BOX WITH SIDE DOOR REMOVED

FIGURE 8.—*Illustration of the "dog ridges" built up in a bale of cotton by the action of the press dogs.*

The dog mechanism operates in conjunction with the movement of the tramper. As the tramper moves downward it momentarily forces the press dogs from their holding position and packs the lint cotton beyond the point at which the dogs protrude into the press box. During the upward motion of the tramper, pressure exerted by the lint cotton against the dogs forces them into a holding position. During the time the dogs are in the holding position, considerable pressure is exerted against them, which causes some of the fibers to overlap at the tops of the dogs in a hairpin- or U-shaped manner. Successive charges of lint from the condenser and the packing action of the tramper gradually cause more cotton to be packed directly under the dogs than on either side (fig. 8). Since gin presses employ from 4 to 6 press dogs on each side of the press, each bale will have from 8 to 12 dog ridges in it.

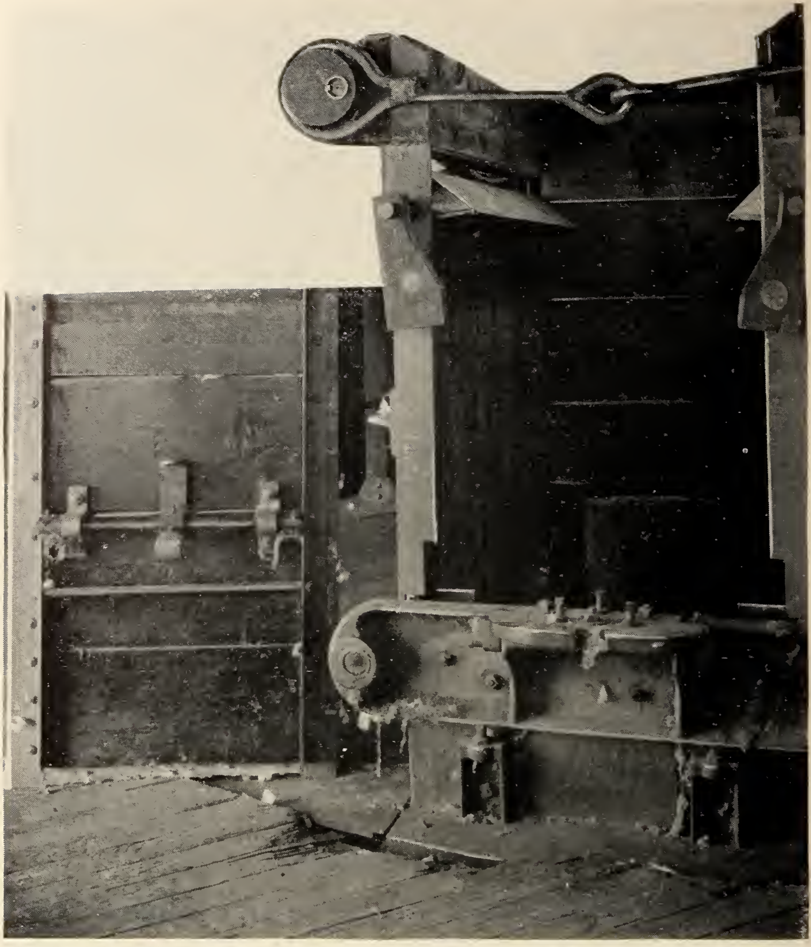

Figure 9.—*Outboard end of press box removed to show profile of plate dogs in retaining position.*

In the past, dog ridges in cotton bales have not been considered undesirable but investigations at commercial compresses have disclosed that they are the chief source of cutting during compression. In fact, observations have shown that 90 percent of all compress cuts occur directly in line with dog ridges, usually when the dog ridges are positioned at a tie channel of the compress.

Even though dog ridges are not a source of trouble to the ginner, they do present serious problems to the compressman. After the bale has been pressed at the gin, nothing can be done to eliminate dog ridges. Standardized types of press dogs have been in use by the gin manufacturers for many years, but it now appears likely that the design of these dogs must be changed in order completely to eliminate uneven packing and the cutting of bales during compression. Research effort on the part of the U. S. Cotton Ginning Laboratory has resulted in the development of a new type press-dog mechanism that offers a solution to this problem.

Modification of dog mechanism to eliminate dog ridges

The elimination of dog ridges and gin dog mechanism trouble is not feasible by the mere removal of the dogs from the press boxes, because a positive retention of cotton below the top of the box is necessary in packing full weight bales to permit turning the press from the filling or packing to the pressing or tie-out position. Experiments have been conducted with various special shapes of dogs in lieu of those now in existence, including discs and straight and reversed curve design. These designs did not provide a solution to the problem. The replacements of existing dogs with individual flat retainers or by various forms of continuous flat plate dogs were found unsuitable.

The solution has been found in the development of a plate-dog mechanism, for which a public patent has been applied. This mechanism provides a hinged prismatic retainer of the lint on each side of the press

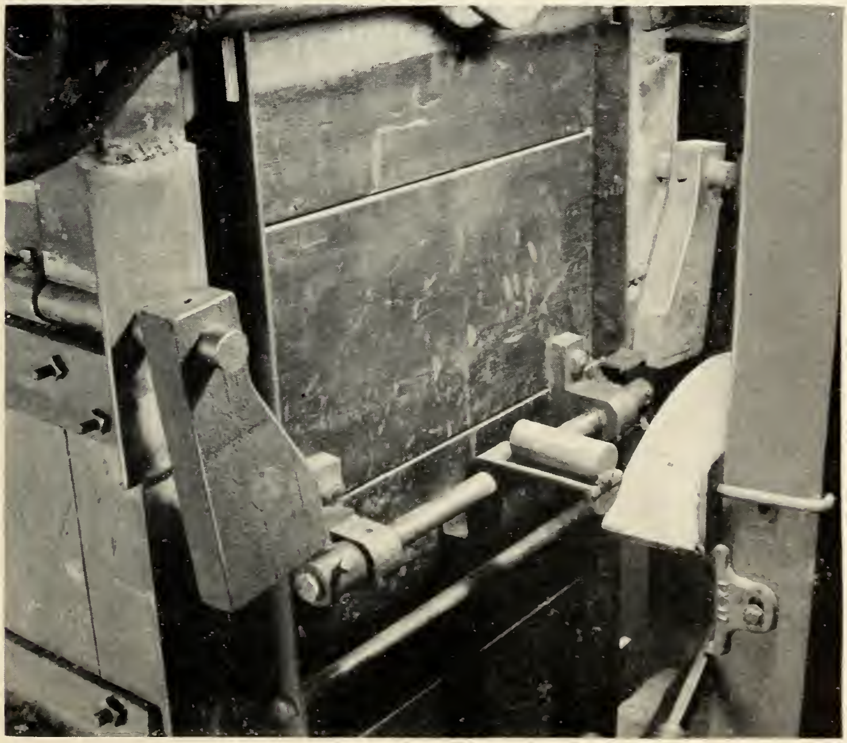

Figure 10.—*Plate-dog cam and counterweights immediately prior to release from retaining position as press box is being swung into pressing and tie-out position.*

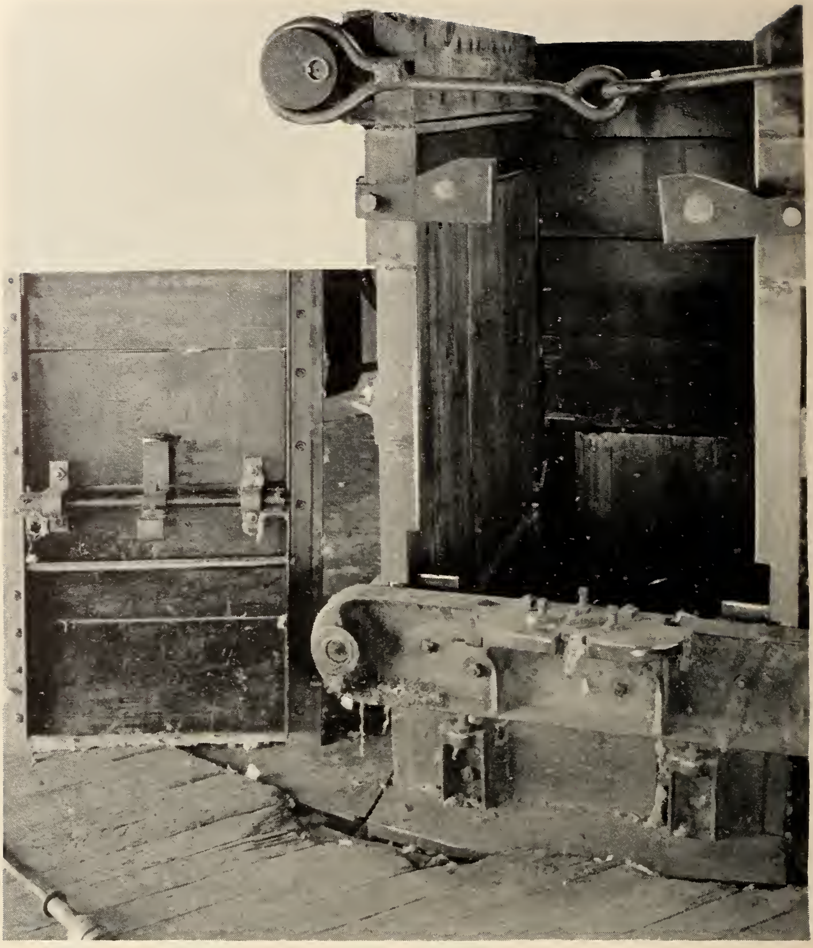

FIGURE 11.—*Outboard end of press box removed to show plate dogs in released position to permit pressing and tie-out of bale.*

box, with means for pivoting or rotating the plate dog out of the retaining position during the pressing period. The unit is semiautomatic, and requires no extra attention during operation.

Essential features in construction and operation of the plate-dog mechanism are shown in figures 9 to 12. Construction elements are relatively simple and embody the principal idea of utilizing one face of steel angles to serve consecutively in a horizontal position for retaining the cotton in the box, and in a vertical position to fit flush with the sides of the press box during pressing. This is accomplished by hinging angle irons at their corners and providing simple latch mechanisms. Figure 13 depicts these two positions of the plate dog.

The plate-dog mechanism consists of two 4×6×3/16×50-inch angle irons, one for each side of the box, positioned near the top in spaces provided by cutting out a 6½-inch aperture from the upper part of the sides of the press box. The angles are trunnioned and keyed on a 1$\frac{3}{16}$-inch shaft by means of four 1¼-inch pipe nipple sleeves which act as hinge members.

The pipe sleeves are 3 inches long and are welded to the angles and keyed or welded to the rocker shafts. The shaft and plate dog are positioned to a hinge bar made with 2×2×3/16×50-inch angles upon which similar pipe sleeves have been welded, so that a complete hinge results. The hinge bars are bolted to the sides of the press box, and are gained or sunk into the outside face of the box so as to provide a smooth surface for the downward leg of the angle; the horizontal leg of the hinge bar rests upon the cut edge of the plate-dog aperture.

When the 6-inch legs of the plate dogs are vertical, the 4-inch legs protrude into the press box to form the dogs. Their theoretical hinges lie

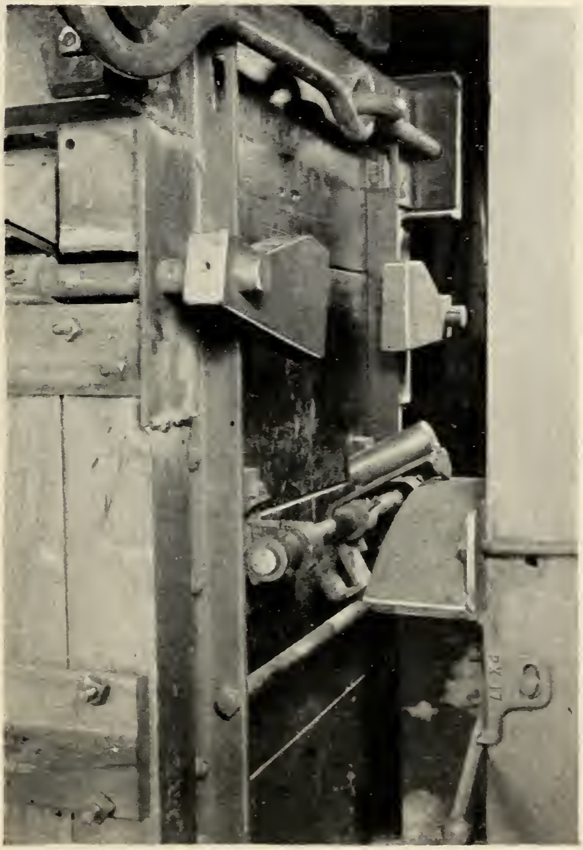

Figure 12.—*Plate-dog cam in release position; counterweights swung up, and press turn table locked into pressing and tie-out position.*

in the plane of the press-box sides. A galvanized plate is welded to the tips of the angle legs to form a smooth hypotenuse slope. Outboard of the press boxes, the extensions of the plate-dog shafts are fitted with suitable counterweights and latches which hold the dogs in place during the packing or tramping. Semiautomatic means release the latch at the proper time when the boxes are turned, but the release can also be effected manually when desired. The protrusion of the two plate dogs within the press box requires narrowing the tramper block to 17 inches, in order that the tramper may freely clear the plates.

The operation of the plate dog is simple and does not require skilled attention nor any predetermined manual manipulation. While the cotton box is being filled, the cotton lint from the condenser enters the box through the funnellike opening provided by the metal sloping faces welded to the angle legs. The horizontal 4-inch backs of the angles prevent upward return of the cotton as the tramper recedes from the box. No lumps of cotton are built up by this simple retaining device, and the centrally located, narrow, funnellike entrance to the box produces a more satisfactory and uniform distribution of the lint in the box.

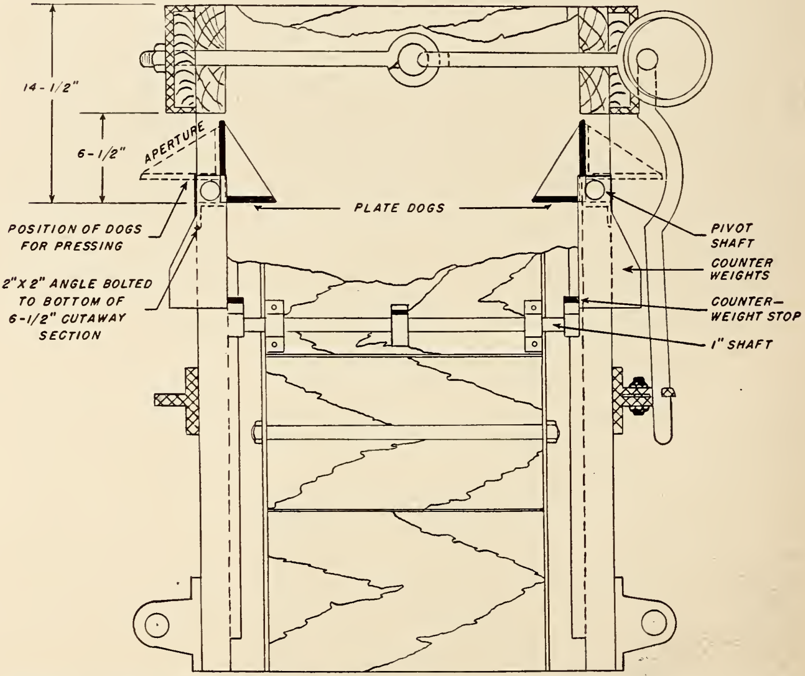

FIGURE 13.—*End view of wooden press box, cut away to show plate dogs in retaining position and (dotted) in pressing and tie-out position.*

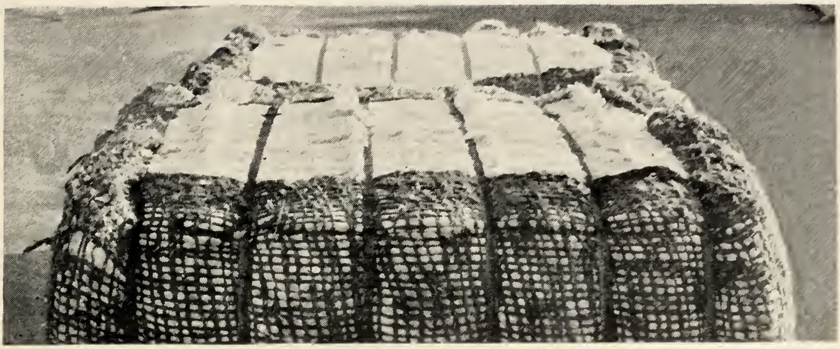

Figure 14.—*Low-density bales packed with conventional gin dogs (foreground) contrasted with bale packed with plate dogs (background). Note prominence of dog ridges in foreground bale and absence of dog ridges in background bale.*

Prior to pressing, the turning of the press table and box mechanically releases the plate-dog latches when the box reaches the pressing position. This release frees the plate dogs from their horizontal or retaining position, and permits them to rotate upward and outward through an arc of 90° as the ram ascends, bringing the 4-inch faces of the dogs into a vertical plane flush with the inner faces of the sides of the press box. The lint under pressure may thus freely move up against the press platen. After the bale has been tied out and the box again swung to the filling or packing position, the turning also again latches the dogs into a retaining position.

The installation of plate dogs on existing presses is much more readily accomplished on wood box than steel box presses, because the wooden box sides can be more easily cut down to provide the aperture for the dogs, and further because the door braces and locks seldom interfere when the box is constructed of wood. Factory construction of the plate dogs on all-steel up-packing presses is practical and feasible both from the standpoint of cost as well as design. No attempts have been made to adapt it, as yet, to down-packing presses, but its adaptability to such presses appears feasible.

Results of commercial and laboratory operation have confirmed the practicability and dependability of the plate dogs. In addition to proving mechanically feasible, plate dog units have eliminated dog ridges and resulting cuts during compression (fig. 14). In a recent test, 50 percent of the bales packed in a press with conventional gin-dog mechanism were cut during compression. The conventional dog mechanism was removed and replaced by the newly developed plate-dog mechanism, with the result that none of the bales packed after the installation of the plate-dog mechanism were cut during compression. During gin pressing operations, it was observed that more uniformly packed bales and less tramper trouble resulted with the new than with the old dog mechanism.

HEAVYWEIGHT BALES AS A FACTOR IN UNEVEN PACKING AND PRESSING DIFFICULTIES

American gin and compress equipment is designed for bales of 500 pounds. Marketing practices and procedures are based on this weight. Any substantial variation either way from this weight causes serious inconvenience and involves additional costs. Overweight, or extra-heavy bales, place undue stress on press equipment which frequently results in press breakdowns. Such bales are burdensome to handle and difficult to tie-out properly during pressing operations. Furthermore, most of the press cutting at compresses is found in heavy bales, as previously pointed out. These cuts, together with bagging tears resulting from the extra strain on the bagging and excessive use of hooks in handling the overweight bales, are serious deterrents to satisfactory appearance of American cotton bales.

Cotton grower, ginner, compressman, and cotton merchant can do much to eliminate the practice of turning out overweight bales. A greater degree of standardization of bale weights would tend to improve the American cotton-bale package, it would reduce marketing and handling costs, and it would prevent many press breakdowns, with a consequent simplification of the problem of obtaining scarce repair parts for gin presses and compresses.

The cotton grower, with very little inconvenience, can eliminate extra-heavy bales by the exercise of greater care in sending to the gin loads of seed cotton that will turn out bales of approximately 500 pounds. He should ascertain the weight of seed cotton of the variety or varieties grown on his farm, required for a 500-pound bale. Usually he knows or can ascertain the lint out-turn or lint percentage for the variety he is growing by checking the first few bales ginned and occasional bales at intervals throughout the ginning season. The number of pounds of seed cotton required for a 500-pound gross-weight bale can be calculated by dividing the lint percentage into the net weight of the bale desired. For example, if the lint percentage is 35 and the weight of bagging and ties is 21 pounds, about 1,370 pounds of seed-cotton would be required for a 500-pound gross-weight bale: $500-21=479$; $\frac{479}{.35}=1{,}369$. Variations in trash and moisture content of the seed cotton throughout the season will necessitate an occasional check of lint turnout. The grower, no doubt, will find it advantageous to have the collaboration of the ginner in working out this problem.

The ginner can aid his patrons in working out estimates of the quantities of seed cotton required for bales of standard weight. He should urge growers to bring their seed cotton to the gin in such quantities as will facilitate the turning out of bales of standard weight. He should keep a record of the tare on all conveyances bringing cotton to his gin, so that he can make a close estimate of the weight of the seed cotton contained in each load. If a conveyance contains seed cotton for more than one bale, and does not have partitions to separate the cotton required for individual bales, the ginner should set his scales at the proper weight so that he may watch the scales and know when enough cotton has been drawn off for a 500-pound bale. If the gin is equipped with a seed scale but not a wagon scale, the ginner can ascertain the amount of seed associated with a 500-pound bale and change from one bale to another when the proper quantity of seed has accumulated in the seed scale. The same methods may be used when ginning seed cotton from a cotton house. Some gin-press operators are able to estimate fairly accurately the proper weight of bales prior to pressing, by manual testing of the pressure on the press dogs.

The compressman can establish policies and charges for his services which will encourage the packing of bales of the proper weight.

The cotton merchant and the cotton manufacturer can, through their policies in purchasing cotton, encourage the packing of bales of standard weight.

SUMMARY AND CONCLUSIONS

Available information indicates that at least one-third of the cotton crop of the United States is packaged in unevenly packed bales. Detailed studies and observations of cotton warehousing, compression, handling, and transportation show that unevenly packed bales are a source of increased cost in time and labor and a frequent source of accidents. Such bales are responsible to a considerable extent for the unsymmetrical and ragged appearance of the American cotton bale.

Individual ginners often fail to realize the importance of producing neat-appearing and uniformly packed bales. Frequently bales are unevenly packed without the gin operator's knowledge and the ill effects of uneven packing do not show until after the bales reach the compress or opening room of the cotton mills.

Packing and pressing bales of uneven density cause unnecessary strain upon the entire gin press assembly which eventually results in breakage of the weaker members of the press mechanism. Ginners can save themselves much time, labor, and money and perform a worth-while service to the cotton industry by exercising greater care in packing and pressing individual bales.

When unevenly packed bales are pressed to standard density, in many instances they have to be torn down and rebuilt before they can be compressed. Such operations require time and effort and reduce compress capacity and also add to compression cost.

Uneven gin packing is attributable to three factors: (1) Improper adjustment of mechanical devices which control and direct the flow of lint cotton to the gin press box; (2) accumulations of lint and trash which at times are permitted to form in the lint flue and on the surface of condenser drum; (3) action of conventional types of gin press-dog mechanisms.

Big-ended bales are commonly produced at many gins. They are most commonly caused by improper adjustment of the lint-flue deflector on some gins and the accumulation of lint and trash forming in the lint flue and on the surface of the condenser drum, which force the delivery of relatively more cotton at one end of the condenser drum than at the opposite end. Obviously, such action causes the individual bale to be thicker at one end than at the opposite end. Frequent cleaning and inspection of lint flues and condensers are practical means of eliminating big-ended bales.

Heavy-sided bales result from the distribution of relatively greater quantities of cotton across the rear side of the press box than across the front side, or vice versa. Such bales usually are caused by improper adjustment of the kicker action, which if too fast will deposit most of the cotton in the front of the press box or if too slow in the rear. In some presses, unsuitable lint slide contour or discharge lip produces the same result. Some measure of the extent to which lint cotton is distributed unevenly from front to rear can be determined by manually testing the pressure exerted against the press dogs.

The so-called dog ridges represent the most serious type of uneven packing of gin bales from the standpoint of the cutting of bales during the process of compression. Dog ridges are the relatively dense masses of lint cotton within an individual bale which accumulate under the gin dogs by the combined action of the tramper and dog mechanism of conventional types of presses. These dog ridges are more prevalent in extra-heavy bales and bales of low-moisture content, which require the application of extra pressure in pressing to customary gin-bale density. Elimination of dog ridges can be accomplished by modifications of conventional types of dog mechanisms. Plate dogs designed and developed at the U. S. Cotton Ginning Laboratory have proved simple in construction and effective as a means of eliminating dog ridges in gin bales.

Pending the modifications of press-dog mechanism, cotton growers, ginners, compressmen, merchants, and manufacturers can do much to help overcome the factors responsible for the poor appearance of American cotton bales and to avoid many unnecessary expenses involved in marketing by adopting standardized practices with respect to bale weight. Cotton growers should make an effort to bring to the gin such amounts of cotton as will provide bales of standard weight. Ginners should encourage farmers to adopt this practice and should follow procedures that will further insure bales that are not overweight. Compressmen can establish policies and charges for their services that will encourage the packing of bales of proper weight. Cotton merchants and manufacturers, through their policies in purchasing cotton, can strongly influence the packing of bales to standard weight. The coordination of these efforts will go a long way toward solving the problems incident to the uneven packing of gin bales.

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